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(54)【発明の名称】　非帯電性ティアシート

(57)【要約】
【課題】　ポリオレフィン系樹脂に導電性繊維を配合して帯電防止性能を付与しつつ、高速で成形した場合でもシート全面にわたって安定した帯電防止性が得られた非帯電性ティアシートを提供する。
【解決手段】　ティアシートは、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂と、導電性繊維材料とを、ポリオレフィン系樹脂に混合した組成物を含み、表面固有抵抗値が$10^{7}\Omega$以下である。

【特許請求の範囲】
【請求項1】 ポリオレフィン系樹脂を含有する非帯電性ティアシートにおいて、
少なくとも、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂と、導電性繊維材料とが、前記ポリオレフィン系樹脂に混合された組成物を含み、表面固有抵抗値が$10^7\Omega$以下であることを特徴とする非帯電性ティアシート。
【請求項2】 前記ポリオレフィン系樹脂および前記ポリオレフィン系骨格がポリプロピレンである、請求項1に記載の非帯電性ティアシート。
【請求項3】 前記親水性ポリマー骨格がポリエチレングリコールである、請求項1または2に記載の非帯電性ティアシート。
【請求項4】 前記共重合樹脂の含有量が3～20質量%である、請求項1ないし3のいずれか1項に記載の非帯電性ティアシート。
【請求項5】 前記導電性繊維材料が炭素繊維である、請求項1ないし4のいずれか1項に記載の非帯電性ティアシート。
【請求項6】 少なくとも表面に抗菌剤が付加された、請求項1ないし5のいずれか1項に記載の非帯電性ティアシート。
【請求項7】 ポリオレフィン系樹脂からなる主層と、該主層の片面または両面に積層された前記組成物からなる表層とからなる、請求項1ないし6のいずれか1項に記載の非帯電性ティアシート。
【請求項8】 厚さが0．3mm～15mmの範囲内である、請求項1ないし7のいずれか1項に記載の非帯電性ティアシート。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、パレット上に容器を多段に積み重ねてユニット化する際に使用されるティアシートに関する。
【0002】
【従来の技術】従来、清涼飲料、ビール、食用油、缶詰等に用いられる金属容器、医薬品、工業薬品、液体調味料等に用いられるガラス容器、あるいは液体洗剤、調味料、アイスクリーム等に用いられるプラスチック容器など、多くの分野で多種多様な容器が大量に使用されている。そして、これらの容器の梱包や搬送などの荷役作業のほとんどは機械化あるいは自動化されている。
【0003】上記の梱包や搬送の一態様として、ユニットロード化がある。この方法は、容器などを梱包したり搬送したりする際にこれらを適当な個数または重量に取りまとめて一単位とし、途中で取り崩すことなく一体的に機器によって荷役を行う方法である。
【0004】すなわち、パレット上に一定個数の容器を多数列多段に積み重ねてユニット化した後、シュリンク包装やストレッチ包装などの梱包を行う荷役作業に供するもので、容器をユニット化する際に、容器の安定化、荷崩れの防止、防塵などの目的で各段ごとにティアシートが挿入される。
【0005】従来、ティアシートとしては、紙製のものが多く用いられている。しかし、紙製のシートは吸水、吸湿などにより、曲げ剛性、耐衝撃性などの機械的強度が低下してくることから反復使用に制限がある。しかも、素材が紙であるため毛羽立ちや破損、汚れが著しく、非衛生的であるので、食品や医療品などの塵埃を嫌う分野では使用が制限される。
【0006】これらの問題を解消するものとしてプラスチック製のティアシートもあるが、プラスチック製のティアシートは帯電が著しく塵埃を引き付け易いという問題がある。そこで、プラスチック製のセパレートシートの帯電を防止する方法として、帯電防止剤やカーボンブラックなどを配合する方法が種々提案されている。しかし、帯電防止剤を配合する方法では、長期間にわたる使用やシートの洗浄によって帯電防止剤が浸出し、これにより、周囲や洗浄液が汚染されたり、帯電防止性能が低下したりしてしまう。一方、カーボンブラックを配合したものでは、カーボンの粉が表面に出る恐れがあり、それ自身が塵埃となったり、環境汚染のもとにもなる。
【0007】そこで、特公平7－59642号公報には、ポリオレフィン系樹脂に導電性繊維を配合することによって帯電防止性能を付与したティアシートが開示されている。このように、導電性繊維を配合することによって、耐水性および機械的強度を向上させつつも、耐久性に優れた帯電防止性能を有し、環境汚染もないティアシートが得られる。
【0008】
【発明が解決しようとする課題】しかしながら、帯電防止性能を付与するために導電性繊維をポリオレフィン系樹脂に配合した場合、ポリオレフィン系樹脂は絶縁性材料であることから、その内部で導電性繊維がネットワークを形成、すなわち、シート全面にわたって導電性繊維同士が互いに接触しているかまたは帯電した電荷を逃がすことができる程度に近接しているかどうかで、帯電防止性能は臨界的に激変する。このため、導電性繊維同士が接触または近接していない領域があると、局所的に帯電防止性能が低下した部位が発生することがあり、帯電防止性能が不安定となってしまう。
【0009】また、導電性繊維を用いた場合、ティアシートを低速で成形しないと、ティアシートの成形中に導電性繊維が折損したり、導電性繊維同士の交絡が得られにくくなったりして導電性繊維間の距離が大きくなり、導電性繊維によるネットワークが損なわれてしまうので、ティアシートの生産性が低下してしまう。
【0010】そこで本発明の目的は、ポリオレフィン系樹脂に導電性繊維を配合して帯電防止性能を付与しつ

つ、高速で成形した場合でもシート全面にわたって安定した帯電防止性能が得られる非帯電性ティアシートを提供することである。

【００１１】

【課題を解決するための手段】上記目的を達成するため本発明の非帯電性ティアシートは、ポリオレフィン系樹脂を含有する非帯電性ティアシートにおいて、少なくとも、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂と、導電性繊維材料とが、前記ポリオレフィン系樹脂に混合された組成物を含み、表面固有抵抗値が$10^7\Omega$以下であることを特徴とする。

【００１２】本発明の非帯電性ティアシートでは、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂をポリオレフィン系樹脂に混合することで、この共重合樹脂はポリオレフィン系樹脂に相溶して分散する。その結果、ティアシートを高速で成形しそれによって導電性繊維間の距離が大きくなった場合でも、共重合樹脂を介して導電性繊維のネットワークが良好に形成されるので、シート全面にわたって安定した帯電防止性能が得られる。

【００１３】

【発明の実施の形態】本発明のティアシートは、ポリオレフィン系樹脂を第１成分、導電性繊維を第２成分、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を第３成分とし、これらを混合して押出成形法などによりシート状に成形されたものである。

【００１４】第２成分である導電性繊維は、ティアシートに帯電防止性能を付与するために用いられる。導電性繊維を含有させることによって、帯電防止剤を配合したもののように洗浄によって帯電防止効果が低下することはなく、永久的に帯電防止性能を維持することができるとともに、カーボンブラックを用いていないので、カーボンブラック自身による塵埃の発生を防止することができる。

【００１５】導電性繊維としては、一般的な炭素繊維の他に、アルミニウム、黄銅、ステンレスなどからなる金属繊維、ガラス繊維に銀、銅、黄銅、ニッケルなどの金属粉末をコーティングした繊維、または、銀、銅、黄銅、ニッケルなどの金属粉末を混入させた合成繊維などが挙げられる。これらの中でも、炭素繊維、及び炭素繊維にニッケルをコーティングをしたものが、剛性や、配合したときの表面抵抗値などの性能面、さらには価格面などから最も好ましい。炭素繊維にはＰＡＮ系とピッチ系があるが、ＰＡＮ系は剛性を向上させることができる。また、繊維は、短繊維あるいは長繊維のいずれでもよいが、少ない配合量で効果が著しい長繊維の方が好ましい。

【００１６】一方、第３成分である共重合樹脂は、ティアシートを高速で成形しても、そのことによる導電性繊維への悪影響を排除し、導電性繊維の特性を最大限に発揮させ、結果的に帯電防止性能をシート全面にわたって安定化させるために用いられる。

【００１７】ポリオレフィン系樹脂に導電性繊維を配合して帯電防止性能を付与する場合、前述したように、シート全面にわたって安定した帯電防止性能を持たせるためには、導電性繊維同士が互いに接触または近接した状態で、シート全面にわたって導電性繊維のネットワークを形成する必要がある。しかし、導電性繊維を配合した場合に、ティアシートを高速で成形しようとすると、成形の際に溶融したポリオレフィン系樹脂に加わる剪断力によって導電性繊維が折損してしまうことがあり、その結果、導電性繊維の平均長さが短くなり、ネットワークが損なわれてしまう。また、特に押出成形において顕著であるが、導電性繊維を配合した場合に成形速度を高くしていくと、導電性繊維が押出方向に整列する度合いが高まり、これと交差する方向での導電性繊維同士の交絡が得られにくくなる。

【００１８】一方、樹脂製品に帯電防止性能を付与する他の方法として、親水性ポリマーを混合し、この親水性ポリマーによって表面に吸着された空気中の水分を介して、樹脂製品に発生した電荷を樹脂製品から逃がし、樹脂製品の帯電を防止することが知られている。このことを利用すれば、たとえ、導電性繊維が折損し、あるいは押出方向に整列する度合いが高まるなどして導電性繊維間の距離が大きくなったとしても、親水性ポリマーを介して導電性繊維のネットワークを形成することも考えられる。しかし、ポリオレフィン系樹脂は疎水性であり親水性を有する添加剤との相溶性がないため、単にポリオレフィン系樹脂に親水性ポリマーを混合しただけでは、両者は成形時に互いに分離して島海構造を形成してしまう。その結果、親水性ポリマーはポリオレフィン系樹脂中に分散することができず、導電性繊維による帯電防止性能をシート全面にわたって安定して発現させることができない。

【００１９】そこで、上述のように、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を第1成分であるポリオレフィン系樹脂のマトリクスに加えることで、共重合樹脂のポリオレフィン系骨格の部分はポリオレフィン系樹脂と相溶性があるため、共重合樹脂は、ポリオレフィン系樹脂のマトリクスに部分的に取り込まれて分散する。このことにより、電荷が移動することのできる導電性繊維間の距離は、ポリオレフィン系樹脂だけの場合と比べて大きくなるので、ティアシートを高速で成形することによって導電性繊維間の距離が大きくなった場合でも、共重合樹脂を介して導電性繊維間を電荷が移動し得る状態とすることができ、ティアシートの全面にわたって安定した帯電防止性能を得ることができる。

【００２０】ティアシートにおける共重合樹脂の含有量は、３～２０質量%が好ましい。３質量%未満では、十

分な帯電防止性能を得ることができなくなるおそれがある。一方、２０質量％を超えると、ポリオレフィン系樹脂のマトリクスの物性を大きく変えてしまうおそれがあり、また、共重合樹脂はポリオレフィン系樹脂よりも高価であるため製造コスト的に不利になる。

【００２１】第1成分であるポリオレフィン系樹脂としては、ポリプロピレン樹脂、ポリエチレン樹脂、エチレンプロピレン共重合樹脂などを好適に用いることができる。共重合樹脂を構成するポリオレフィン系骨格としては、共重合樹脂をポリオレフィン系樹脂中により均一に分散させるためには、ポリオレフィン系樹脂と同じ材料を用いるのが好ましい。たとえば、ポリオレフィン系樹脂がポリプロピレンである場合、ポリオレフィン系骨格にもポリプロピレンが好適に用いられる。また、共重合樹脂を構成する親水性ポリマー骨格としては、アミド基、アルコール基、カルボキシル基などを持ったポリマーを利用することができ、具体的には、ポリアミド骨格、ポリビニルアルコール骨格、ポリエチレングリコール骨格などが挙げられる。

【００２２】ティアシートの表面固有抵抗値は、塵埃を呼び寄せにくい値が要求されるが、導電性繊維を含有していることを考慮すると、$10^7\Omega$以下であることが必要である。表面固有抵抗値が$10^7\Omega$を超えると、帯電防止性能が低く、塵埃を呼び寄せ易くなる。ティアシートの厚さは０．３～１５ｍｍの範囲であることが適当である。厚さが０．３ｍｍ未満では、ティアシートの剛性などの機械的強度が十分でなく、また、１５ｍｍを超えると、ティアシートの重量が大きくなり、荷役作業の自動化や取り扱いに支障を来たすおそれを生じる。

【００２３】ティアシートが、飲食品用容器あるいは薬品用容器など衛生性を要求される容器の搬送や梱包に用いられる場合、ティアシートに黴や雑菌が発生するのを抑えるために、抗菌剤を少なくとも表面に付加することが好ましい。抗菌剤としては、特に制限されないが、銀、銅、亜鉛などの抗菌性金属、特に銀イオンを含有した溶解性ガラスを好適に用いることができる。また、抗菌剤をティアシートに付加する方法としては、成形後のティアシートの表面に抗菌剤を塗布する方法、および成形前のティアシート材料に第4の成分として抗菌剤を添加する方法のいずれも適用可能である。成形前のティアシート材料に抗菌剤を添加する方法は、成形後の塗布工程が不要であるので、製造工程が簡略化され、製造コストの低減を図ることができる。

【００２４】上述した例では、単層のティアシートを例に挙げて説明したが、多層構造としてもよい。この場合、ポリオレフィン系樹脂からなるシートを主層とし、その片面または両面に、上記の少なくとも第１～第３成分を含むシートを表層として積層した構造とすることで、導電性繊維および共重合樹脂の使用量を減らすことができる。

【００２５】

【実施例】以下に、本発明の具体的な実施例について、比較例とともに説明する。

【００２６】（実施例１）第1成分であるポリオレフィン系樹脂として、サンアロマー社製ポリプロピレン、Ｅ３００Ａ（商品名）、第２成分である導電性繊維として、東邦テナックス社製炭素繊維、ベスファイトＨＴＡ（商品名）、第３成分である共重合樹脂として、三洋化成工業社製帯電防止剤、ペレスタット３０００（商品名）を用い、これらを混合して単層Ｔダイ装置で成形し、厚さが１ｍｍのティアシートを作成した。本例で用いた共重合樹脂は、ポリオレフィン系骨格としてポリプロピレンを有し、親水性ポリマー骨格としてポリエチレングリコールを有する。また、導電性繊維の含有量は１０質量％、共重合樹脂の含有量は５質量％とした。単層Ｔダイ装置の成形能力は、最大で１０ｍ／分であり、本例ではその最大速度で成形した。

【００２７】（実施例２）多層Ｔダイ装置を用い、主層と表層との２層構造のティアシートを作製した。主層を構成する材料には、サンアロマー社製ポリプロピレン、Ｅ３００Ａ（商品名）を用いた。表層は、実施例１で用いたものと同じ組成とした。各層の厚さは、主層が０．８５ｍｍ、表層が０．１５ｍｍとし、ティアシート全体での厚さを１ｍｍとした。多層Ｔダイ装置の成形能力は、最大で１０ｍ／分であり、本例ではその最大速度で成形した。

【００２８】（比較例１）実施例１で用いたポリプロピレンと炭素繊維とを混合して実施例１と同じ単層Ｔダイ装置で成形し、厚さが１ｍｍのティアシートを作製した。炭素繊維の含有量は、１０質量％とした。ティアシートの成形速度は１０ｍ／分とした。

【００２９】（比較例２）成形速度を４ｍ／分としたこと以外は比較例１と同様にしてティアシートを作製した。

【００３０】上述した実施例１，２および比較例１，２の組成および評価結果を表１に示す。なお、表1において、生産性については、ティアシートを成形装置の最大速度で成形した場合を「○」、最大速度の半分以下の速度で成形した場合を「×」で表している。

【００３１】

【表１】

	組　　成	成形速度 (m／分)	表面固有抵抗値 (Ω)	生産性
実施例1	ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール）	１０	10^{6}	○
実施例2	表層 ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール 主層 ポリプロピレン	１０	10^{6}	○
比較例1	ポリプロピレン 炭素繊維　１０質量%	１０	10^{10} 以上	○
比較例2	ポリプロピレン 炭素繊維　１０質量%	４	10^{6}	×

【００３２】実施例１および２では、Ｔダイ装置の最大能力で成形を行っても問題なく成形することができ、また、表面固有抵抗値も10^{7}Ω以下となり、十分な帯電防止性能を持つティアシートを得ることができた。一方、比較例においては、成形速度を早くして生産性を向上させようとすると、炭素繊維のネットワーク構造が十分に形成されず、その結果、表面固有抵抗値も高くなり必要な帯電防止性能を持たせることができなかった（比較例１）。逆に、炭素繊維のネットワーク構造を形成して表面固有抵抗値を10^{7}Ω以下としようとすると成形速度が遅くなってしまい、生産性が低下する（比較例２）。以上から、ポリオレフィン系骨格および親水性ポリマー骨格を持つ共重合樹脂を含有させることで、炭素繊維のネットワークが良好に形成されて安定した帯電防止性能を有するティアシートを高い生産性で製造することができる。

【００３３】

【発明の効果】以上説明したように本発明によれば、ポリオレフィン系樹脂を含有するティアシートにおいて、ポリオレフィン系骨格および親水性ポリマー骨格の双方を持つ共重合樹脂を混合することで、この共重合樹脂はポリオレフィン系樹脂に相溶して分散するので、ティアシートを高速で成形して導電性繊維間の距離が大きくなった場合でも、共重合樹脂を介して導電性繊維のネットワークが形成され、シート全面にわたって安定した帯電防止性能を得ることができる。

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(54) ANTISTATIC TEAR SHEET

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an antistatic tear sheet with which antistatic performance is given with a conductive fiber blended into a polyolefin-based resin and in addition stable antistatic properties can be obtained on an entire sheet even if the sheet is formed at a high speed.
SOLUTION: The tear sheet comprises a composition including a copolymer resin having both a polyolefin-based skeleton and a hydrophillic polymer skeleton and a conductive fiber material which are mixed into a polyolefin-based resin. Its surface resistivity value is 107 Ω or less.

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CLAIMS

[Claim(s)]
[Claim 1] The un-charging nature TIA sheet characterized by a surface specific resistance value being 107ohms or less including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame and conductive textile materials were mixed by said polyolefine system resin at least in the un-charging nature TIA sheet containing polyolefine system resin.
[Claim 2] The un-charging nature TIA sheet according to claim 1 said polyolefine system resin and said whose polyolefine system frame are polypropylene.
[Claim 3] The un-charging nature TIA sheet according to claim 1 or 2 said whose hydrophilic polymer frame is a polyethylene glycol.
[Claim 4] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 3 whose content of said copolymerization resin is three to 20 mass %.
[Claim 5] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 4 said whose conductive textile materials are a carbon fiber.
[Claim 6] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 5 by which the antimicrobial agent was added at least to the front face.
[Claim 7] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 6 which consists of a main stratum which consists of polyolefine system resin, and a surface which consists of said constituent by which the laminating was carried out to one side or both sides of this main stratum.
[Claim 8] An un-charging nature TIA sheet given in claim 1 thru/or any 1 term of 7 which is within the limits whose thickness is 0.3mm - 15mm.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the TIA sheet used in case unitization of the container is accumulated and carried out on a pallet multistage.
[0002]
[Description of the Prior Art] Conventionally, a variety of containers are used for the large quantity in many fields, such as a plastic envelope used for the glassware used for the metal vessel and drugs which are used for a soft drink, Biel, edible oil, canning, etc., heavy chemicals, a liquid seasoning, etc. or liquid detergent, a seasoning, ice cream, etc. And most of cargo work activities, such as packing of these containers and conveyance, are mechanized or automated.
[0003] There is unit load-ization as one mode of the above-mentioned packing or conveyance. This approach is an approach a device performs cargo work in one, without adjusting these in the suitable number or weight, considering as one unit, and pulling down on the way, in case a container etc. is packed up or conveyed.
[0004] Namely, in case the cargo work activity which packs up shrink packaging, stretch packaging, etc. is presented and unitization of the container is carried out after accumulating and carrying out unitization of many containers of the fixed number on a pallet train multistage, a TIA sheet is inserted for every stage for the object, such as stabilization of a container, prevention of collapse of cargo piles, and protection against dust.
[0005] Conventionally, many things made of paper are used as a TIA sheet. However, according to water absorption, moisture absorption, etc., since mechanical strengths, such as flexural rigidity and shock resistance, fall, the sheet made of paper has a limit in periodic duty. And since a raw material is paper and they are [fuzz, and breakage and dirt are remarkable and] insanitary, an activity is restricted in the field which dislikes dust, such as food and medical supplies.
[0006] Although the TIA sheet made from plastics is also one of those solve these problems, the TIA sheet made from plastics has the problem that electrification tends to draw dust remarkably. Then, the approach of blending an antistatic agent, carbon black, etc. is variously proposed as an approach of preventing electrification of the separate seat made from plastics. However, by the approach of blending an antistatic agent, by the activity over a long period of time, or washing of a sheet, an antistatic agent exudes, thereby, a perimeter and a penetrant remover will be polluted or the antistatic engine performance will fall. On the other hand, in what blended carbon black, there is a possibility that the powder of carbon may come out to a front face, and itself becomes dust or also becomes the basis of environmental pollution.
[0007] Then, the TIA sheet which gave the antistatic engine performance to JP,7-59642,B by blending conductive fiber with polyolefine system resin is indicated. Thus, although a water resisting property and a mechanical strength are raised by blending conductive fiber, it has the antistatic engine performance excellent in endurance, and the TIA sheet which environmental pollution does not have, either is obtained.
[0008]
[Problem(s) to be Solved by the Invention] or [however, / that conductive fiber touches /

conductive fiber / the network mutually over formation, i.e., the whole sheet surface, in the interior since polyolefine system resin is an insulating ingredient when conductive fiber is blended with polyolefine system resin, in order to give the antistatic engine performance] — or it is close to extent which can miss the electrified charge, and the antistatic engine performance changes suddenly in criticality. For this reason, if there is a field in which conductive fiber touches or is not close, the part to which the antistatic engine performance fell locally may occur, and the antistatic engine performance will become instability.

[0009] Moreover, since conductive fiber will break during shaping of a TIA sheet, or the confounding of conductive fiber will become is hard to be obtained, the distance between conductive fiber will become large and the network by conductive fiber will be spoiled if a TIA sheet is not fabricated at a low speed when conductive fiber is used, the productivity of a TIA sheet will fall.

[0010] Then, the object of this invention blending conductive fiber with polyolefine system resin, and giving the antistatic engine performance, even when it fabricates at high speed, it is offering the un-charging nature TIA sheet with which the antistatic engine performance stabilized over the whole sheet surface is obtained.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned object, the un-charging nature TIA sheet of this invention is characterized by a surface specific resistance value being 107ohms or less at least in the un-charging nature TIA sheet containing polyolefine system resin including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame and conductive textile materials were mixed by said polyolefine system resin.

[0012] By mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to polyolefine system resin, this copolymerization resin is compatible in polyolefine system resin, and the un-charging nature TIA sheet of this invention distributes it. Consequently, since the network of conductive fiber is formed good through copolymerization resin even when a TIA sheet is fabricated at high speed and the distance between conductive fiber becomes large by it, the antistatic engine performance stabilized over the whole sheet surface is obtained.

[0013]

[Embodiment of the Invention] The TIA sheet of this invention uses as the 3rd component the copolymerization resin in which it has the 1st component for polyolefine system resin, and it has the both sides of the 2nd component, a polyolefine system frame, and a hydrophilic polymer frame for conductive fiber, mixes these, and is fabricated by the extrusion method etc. in the shape of a sheet.

[0014] The conductive fiber which is the 2nd component is used in order to give the antistatic engine performance to a TIA sheet. Since carbon black is not used while the antistatic effectiveness cannot fall by washing like and being able to maintain the antistatic engine performance eternally, although the antistatic agent was blended by making conductive fiber contain, generating of the dust by carbon black itself can be prevented.

[0015] The synthetic fiber in which metal powder, such as the metal fiber which consists of aluminum, brass, stainless steel, etc. besides a general carbon fiber as conductive fiber, fiber which coated the glass fiber with metal powder, such as silver, copper, brass, and nickel, or silver, copper, brass, and nickel, was made to mix is mentioned. Also in these, what carried out coating for nickel to the carbon fiber and the carbon fiber is the most desirable from a price side etc. to engine-performance sides, such as rigidity and a surface-electrical-resistance value when blending, and a pan. Although there are a PAN system and a pitch system in a carbon fiber, a PAN system can raise rigidity. Moreover, although any of a staple fiber or continuous glass fiber are sufficient as fiber, its continuous glass fiber with remarkable effectiveness is more desirable at small loadings.

[0016] On the other hand, even if it fabricates a TIA sheet at high speed, the copolymerization resin which is the 3rd component eliminates the adverse effect to the conductive fiber by that,

stabilize the antistatic engine performance over the whole sheet surface as a result.
[0017] In order to give the antistatic engine performance stabilized over the whole sheet surface as mentioned above when blending conductive fiber with polyolefine system resin and giving the antistatic engine performance, conductive fiber needs to form the network of conductive fiber over the whole sheet surface in the condition of having contacted or approached mutually. However, if it is going to fabricate a TIA sheet at high speed when conductive fiber is blended, conductive fiber may break according to the shearing force which joins the polyolefine system resin fused on the occasion of shaping, consequently the average die length of conductive fiber will become short, and a network will be spoiled. Moreover, although it is remarkable in especially extrusion molding, if the shaping rate is made high when conductive fiber is blended, the degree to which conductive fiber aligns at the direction of extrusion will increase, and the confounding of the conductive fiber in the direction which intersects this will become is hard to be obtained.
[0018] On the other hand, as other approaches of giving the antistatic engine performance to a resin product, a hydrophilic polymer is mixed, the charge generated for the resin product is missed from a resin product through the moisture in the air with which the front face was adsorbed by this hydrophilic polymer, and preventing electrification of a resin product is known. If this is used, even if the degree which conductive fiber breaks or aligns even if at the direction of extrusion will increase and the distance between conductive fiber will become large, forming the network of conductive fiber through a hydrophilic polymer is also considered. However, since polyolefine system resin does not have compatibility with the additive which is hydrophobicity and has a hydrophilic property, only by mixing a hydrophilic polymer to polyolefine system resin, both will dissociate mutually at the time of shaping, and will form **** structure at it. Consequently, it cannot distribute in polyolefine system resin, and a hydrophilic polymer can be stabilized and cannot make the antistatic engine performance by conductive fiber discover over the whole sheet surface.
[0019] Then, by adding copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to the matrix of the polyolefine system resin which is the 1st component as mentioned above, since the part of the polyolefine system frame of copolymerization resin has polyolefine system resin and compatibility, copolymerization resin is selectively incorporated by the matrix of polyolefine system resin, and it distributes it to it. Since the distance between the conductive fiber which a charge can move becomes large by this compared with the case of only polyolefine system resin, even when the distance between conductive fiber becomes large by fabricating a TIA sheet at high speed, between conductive fiber can be made into the condition that a charge can move, through copolymerization resin, and the antistatic engine performance stabilized over the whole surface of a TIA sheet can be obtained.
[0020] The content of the copolymerization resin in a TIA sheet has desirable 3 – 20 mass %. There is a possibility that it may become impossible to obtain sufficient antistatic engine performance, under by 3 mass %. On the other hand, if 20 mass % is exceeded, there is a possibility of changing the physical properties of the matrix of polyolefine system resin a lot, and since copolymerization resin is more expensive than polyolefine system resin, it will become disadvantageous in manufacturing cost.
[0021] As polyolefine system resin which is the 1st component, polypropylene resin, polyethylene resin, ethylene propylene copolymerization resin, etc. can be used suitably. As a polyolefine system frame which constitutes copolymerization resin, in order to make homogeneity distribute copolymerization resin by the inside of polyolefine system resin, it is desirable to use the same ingredient as polyolefine system resin. For example, when polyolefine system resin is polypropylene, polypropylene is suitably used also for a polyolefine system frame. Moreover, as a hydrophilic polymer frame which constitutes copolymerization resin, a polymer with an amide group, an alcoholic radical, a carboxyl group, etc. can be used, and, specifically, a polyamide frame, a polyvinyl alcohol frame, a polyethylene–glycol frame, etc. are mentioned.
[0022] The surface specific resistance value of a TIA sheet needs to be 107ohms or less, if it takes containing conductive fiber into consideration, although the value which cannot call dust

performance will be low and it will become easy to call dust. It is suitable for the thickness of a TIA sheet that it is the range of 0.3-15mm. If less than 0.3mm of thickness is not enough as mechanical strengths of a TIA sheet, such as rigidity, and it exceeds 15mm, the weight of a TIA sheet will become large and a possibility of causing trouble to automation of a cargo work activity and handling will be produced.

[0023] When a TIA sheet is used for conveyance and packing of a container of which health nature, such as a container for eating-and-drinking articles or a container for chemicals, is required, in order to suppress that mold and saprophytic bacteria are generated on a TIA sheet, it is desirable to add an antimicrobial agent to a front face at least. Especially as an antimicrobial agent, although not restricted, the soluble glass containing antibacterial metals, such as silver, copper, and zinc, especially complex ion can be used suitably. Moreover, as an approach of adding an antimicrobial agent to a TIA sheet, both the approach of applying an antimicrobial agent to the front face of the TIA sheet after shaping and the approach of adding an antimicrobial agent as the 4th component to the Tia sheet material before shaping are applicable. Since the spreading process after shaping is unnecessary, a production process is simplified and the approach of adding an antimicrobial agent to the Tia sheet material before shaping can aim at reduction of a manufacturing cost.

[0024] Although the TIA sheet of a monolayer was mentioned as the example and the example mentioned above explained it, it is good also as multilayer structure. In this case, the amount of conductive fiber and the copolymerization resin used can be reduced by considering as the structure which used as the main stratum the sheet which consists of polyolefine system resin, made the surface the above-mentioned sheet which contains the 1st - the 3rd component at least, and carried out the laminating to those one side or both sides.

[0025]

[Example] Below, the concrete example of this invention is explained with the example of a comparison.

[0026] (Example 1) As polyolefine system resin which is the 1st component, using the antistatic agent by Sanyo Chemical Industries, Ltd., and PERESUTATTO 3000 (trade name) as copolymerization resin which is the carbon fiber by Toho Tenax Co., Ltd., BESUFAITO HTA (trade name), and the 3rd component, as conductive fiber which is Sun Alomar polypropylene, E300A (trade name), and the 2nd component, these were mixed, it fabricated with monolayer T-die equipment, and the TIA sheet whose thickness is 1mm was created. The copolymerization resin used by this example has polypropylene as a polyolefine system frame, and has a polyethylene glycol as a hydrophilic polymer frame. Moreover, the content of conductive fiber made the content of 10 mass % and copolymerization resin 5 mass %. The forming performance force of monolayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.

[0027] (Example 2) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. Sun Alomar polypropylene and E300A (trade name) were used for the ingredient which constitutes a main stratum. The surface was taken as the same presentation as what was used in the example 1. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. The forming performance force of multilayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.

[0028] (Example 1 of a comparison) The polypropylene and the carbon fiber which were used in the example 1 were mixed, it fabricated with the same monolayer T-die equipment as an example 1, and the TIA sheet whose thickness is 1mm was produced. The content of a carbon fiber was made into 10 mass %. The shaping rate of a TIA sheet was considered as a part for 10m/.

[0029] (Example 2 of a comparison) The TIA sheet was produced like the example 1 of a comparison except having considered the shaping rate as a part for 4m/.

[0030] A presentation and assessment result of the examples 1 and 2 mentioned above and the examples 1 and 2 of a comparison are shown in a table 1. In addition, in a table 1, the case where the case where a TIA sheet is fabricated with the maximum velocity of shaping equipment is

productivity.
[0031]
[A table 1]

	組　　成	成形速度 (m／分)	表面固有抵抗値 (Ω)	生産性
実施例1	ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール）	１０	10^{6}	○
実施例2	表層 ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール 主層 ポリプロピレン	１０	10^{6}	○
比較例1	ポリプロピレン 炭素繊維　１０質量%	１０	10^{10} 以上	○
比較例2	ポリプロピレン 炭素繊維　１０質量%	4	10^{6}	×

[0032] In the examples 1 and 2, even if fabricated by the maximum capacity of T-die equipment, it could fabricate satisfactory, and the surface specific resistance value was also able to be set to 107ohms or less, and the TIA sheet with sufficient antistatic engine performance was able to be obtained. On the other hand, when a shaping rate tends to be carried out early and it was going to raise productivity in the example of a comparison, the network structure of a carbon fiber was not fully able to be formed, consequently a surface specific resistance value was not able to become high, either, and the required antistatic engine performance was not able to be given (example 1 of a comparison). On the contrary, if the network structure of a carbon fiber tends to be formed and it is going to set a surface specific resistance value to 107ohms or less, a shaping rate will become slow and productivity will fall (example 2 of a comparison). As mentioned above, the TIA sheet which has the antistatic engine performance by which the network of a carbon fiber was formed good and stabilized by making copolymerization resin with a polyolefine system frame and a hydrophilic polymer frame contain can be manufactured for high productivity.
[0033]
[Effect of the Invention] As explained above, in the TIA sheet containing polyolefine system resin, by mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame, this copolymerization resin is compatible in polyolefine system resin, and this invention distributes it. Therefore, even when a TIA sheet is fabricated at high speed and the distance between conductive fiber becomes large, the network of conductive fiber is formed through copolymerization resin, and the antistatic engine performance stabilized over the whole sheet surface can be obtained.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the TIA sheet used in case unitization of the container is accumulated and carried out on a pallet multistage.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Conventionally, a variety of containers are used for the large quantity in many fields, such as a plastic envelope used for the glassware used for the metal vessel and drugs which are used for a soft drink, Biel, edible oil, canning, etc., heavy chemicals, a liquid seasoning, etc. or liquid detergent, a seasoning, ice cream, etc. And most of cargo work activities, such as packing of these containers and conveyance, are mechanized or automated.
[0003] There is unit load-ization as one mode of the above-mentioned packing or conveyance. This approach is an approach a device performs cargo work in one, without adjusting these in the suitable number or weight, considering as one unit, and pulling down on the way, in case a container etc. is packed up or conveyed.
[0004] Namely, in case the cargo work activity which packs up shrink packaging, stretch packaging, etc. is presented and unitization of the container is carried out after accumulating and carrying out unitization of many containers of the fixed number on a pallet train multistage, a TIA sheet is inserted for every stage for the object, such as stabilization of a container, prevention of collapse of cargo piles, and protection against dust.
[0005] Conventionally, many things made of paper are used as a TIA sheet. However, according to water absorption, moisture absorption, etc., since mechanical strengths, such as flexural rigidity and shock resistance, fall, the sheet made of paper has a limit in periodic duty. And since a raw material is paper and they are [fuzz, and breakage and dirt are remarkable and] insanitary, an activity is restricted in the field which dislikes dust, such as food and medical supplies.
[0006] Although the TIA sheet made from plastics is also one of those solve these problems, the TIA sheet made from plastics has the problem that electrification tends to draw dust remarkably. Then, the approach of blending an antistatic agent, carbon black, etc. is variously proposed as an approach of preventing electrification of the separate seat made from plastics. However, by the approach of blending an antistatic agent, by the activity over a long period of time, or washing of a sheet, an antistatic agent exudes, thereby, a perimeter and a penetrant remover will be polluted or the antistatic engine performance will fall. On the other hand, in what blended carbon black, there is a possibility that the powder of carbon may come out to a front face, and itself becomes dust or also becomes the basis of environmental pollution.
[0007] Then, the TIA sheet which gave the antistatic engine performance to JP,7-59642,B by blending conductive fiber with polyolefine system resin is indicated. Thus, although a water resisting property and a mechanical strength are raised by blending conductive fiber, it has the antistatic engine performance excellent in endurance, and the TIA sheet which environmental pollution does not have, either is obtained.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, in the TIA sheet containing polyolefine system resin, by mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame, this copolymerization resin is compatible in polyolefine system resin, and this invention distributes it. Therefore, even when a TIA sheet is fabricated at high speed and the distance between conductive fiber becomes large, the network of conductive fiber is formed through copolymerization resin, and the antistatic engine performance stabilized over the whole sheet surface can be obtained.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] or [however, / that conductive fiber touches / conductive fiber / the network mutually over formation, i.e., the whole sheet surface, in the interior since polyolefine system resin is an insulating ingredient when conductive fiber is blended with polyolefine system resin, in order to give the antistatic engine performance] — or it is close to extent which can miss the electrified charge, and the antistatic engine performance changes suddenly in criticality. For this reason, if there is a field in which conductive fiber touches or is not close, the part to which the antistatic engine performance fell locally may occur, and the antistatic engine performance will become instability.
[0009] Moreover, since conductive fiber will break during shaping of a TIA sheet, or the confounding of conductive fiber will become is hard to be obtained, the distance between conductive fiber will become large and the network by conductive fiber will be spoiled if a TIA sheet is not fabricated at a low speed when conductive fiber is used, the productivity of a TIA sheet will fall.
[0010] Then, the object of this invention blending conductive fiber with polyolefine system resin, and giving the antistatic engine performance, even when it fabricates at high speed, it is offering the un-charging nature TIA sheet with which the antistatic engine performance stabilized over the whole sheet surface is obtained.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned object, the un-charging nature TIA sheet of this invention is characterized by a surface specific resistance value being 107ohms or less at least in the un-charging nature TIA sheet containing polyolefine system resin including the constituent with which copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame and conductive textile materials were mixed by said polyolefine system resin.
[0012] By mixing copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to polyolefine system resin, this copolymerization resin is compatible in polyolefine system resin, and the un-charging nature TIA sheet of this invention distributes it. Consequently, since the network of conductive fiber is formed good through copolymerization resin even when a TIA sheet is fabricated at high speed and the distance between conductive fiber becomes large by it, the antistatic engine performance stabilized over the whole sheet surface is obtained.
[0013]
[Embodiment of the Invention] The TIA sheet of this invention uses as the 3rd component the copolymerization resin in which it has the 1st component for polyolefine system resin, and it has the both sides of the 2nd component, a polyolefine system frame, and a hydrophilic polymer frame for conductive fiber, mixes these, and is fabricated by the extrusion method etc. in the shape of a sheet.
[0014] The conductive fiber which is the 2nd component is used in order to give the antistatic engine performance to a TIA sheet. Since carbon black is not used while the antistatic effectiveness cannot fall by washing like and being able to maintain the antistatic engine performance eternally, although the antistatic agent was blended by making conductive fiber contain, generating of the dust by carbon black itself can be prevented.
[0015] The synthetic fiber in which metal powder, such as the metal fiber which consists of aluminum, brass, stainless steel, etc. besides a general carbon fiber as conductive fiber, fiber which coated the glass fiber with metal powder, such as silver, copper, brass, and nickel, or silver, copper, brass, and nickel, was made to mix is mentioned. Also in these, what carried out coating for nickel to the carbon fiber and the carbon fiber is the most desirable from a price side etc. to engine-performance sides, such as rigidity and a surface-electrical-resistance value when blending, and a pan. Although there are a PAN system and a pitch system in a carbon fiber, a PAN system can raise rigidity. Moreover, although any of a staple fiber or continuous glass fiber are sufficient as fiber, its continuous glass fiber with remarkable effectiveness is more desirable at small loadings.
[0016] On the other hand, even if it fabricates a TIA sheet at high speed, the copolymerization resin which is the 3rd component eliminates the adverse effect to the conductive fiber by that, demonstrates the property of conductive fiber to the maximum extent, and it is used in order to stabilize the antistatic engine performance over the whole sheet surface as a result.
[0017] In order to give the antistatic engine performance stabilized over the whole sheet surface as mentioned above when blending conductive fiber with polyolefine system resin and giving the antistatic engine performance, conductive fiber needs to form the network of conductive fiber

over the whole sheet surface in the condition of having contacted or approached mutually. However, if it is going to fabricate a TIA sheet at high speed when conductive fiber is blended, conductive fiber may break according to the shearing force which joins the polyolefine system resin fused on the occasion of shaping, consequently the average die length of conductive fiber will become short, and a network will be spoiled. Moreover, although it is remarkable in especially extrusion molding, if the shaping rate is made high when conductive fiber is blended, the degree to which conductive fiber aligns at the direction of extrusion will increase, and the confounding of the conductive fiber in the direction which intersects this will become is hard to be obtained.

[0018] On the other hand, as other approaches of giving the antistatic engine performance to a resin product, a hydrophilic polymer is mixed, the charge generated for the resin product is missed from a resin product through the moisture in the air with which the front face was adsorbed by this hydrophilic polymer, and preventing electrification of a resin product is known. If this is used, even if the degree which conductive fiber breaks or aligns even if at the direction of extrusion will increase and the distance between conductive fiber will become large, forming the network of conductive fiber through a hydrophilic polymer is also considered. However, since polyolefine system resin does not have compatibility with the additive which is hydrophobicity and has a hydrophilic property, only by mixing a hydrophilic polymer to polyolefine system resin, both will dissociate mutually at the time of shaping, and will form **** structure at it. Consequently, it cannot distribute in polyolefine system resin, and a hydrophilic polymer can be stabilized and cannot make the antistatic engine performance by conductive fiber discover over the whole sheet surface.

[0019] Then, by adding copolymerization resin with the both sides of a polyolefine system frame and a hydrophilic polymer frame to the matrix of the polyolefine system resin which is the 1st component as mentioned above, since the part of the polyolefine system frame of copolymerization resin has polyolefine system resin and compatibility, copolymerization resin is selectively incorporated by the matrix of polyolefine system resin, and it distributes it to it. Since the distance between the conductive fiber which a charge can move becomes large by this compared with the case of only polyolefine system resin, even when the distance between conductive fiber becomes large by fabricating a TIA sheet at high speed, between conductive fiber can be made into the condition that a charge can move, through copolymerization resin, and the antistatic engine performance stabilized over the whole surface of a TIA sheet can be obtained.

[0020] The content of the copolymerization resin in a TIA sheet has desirable 3 – 20 mass %. There is a possibility that it may become impossible to obtain sufficient antistatic engine performance, under by 3 mass %. On the other hand, if 20 mass % is exceeded, there is a possibility of changing the physical properties of the matrix of polyolefine system resin a lot, and since copolymerization resin is more expensive than polyolefine system resin, it will become disadvantageous in manufacturing cost.

[0021] As polyolefine system resin which is the 1st component, polypropylene resin, polyethylene resin, ethylene propylene copolymerization resin, etc. can be used suitably. As a polyolefine system frame which constitutes copolymerization resin, in order to make homogeneity distribute copolymerization resin by the inside of polyolefine system resin, it is desirable to use the same ingredient as polyolefine system resin. For example, when polyolefine system resin is polypropylene, polypropylene is suitably used also for a polyolefine system frame. Moreover, as a hydrophilic polymer frame which constitutes copolymerization resin, a polymer with an amide group, an alcoholic radical, a carboxyl group, etc. can be used, and, specifically, a polyamide frame, a polyvinyl alcohol frame, a polyethylene–glycol frame, etc. are mentioned.

[0022] The surface specific resistance value of a TIA sheet needs to be 107ohms or less, if it takes containing conductive fiber into consideration, although the value which cannot call dust easily is required. If a surface specific resistance value exceeds 107 ohms, the antistatic engine performance will be low and it will become easy to call dust. It is suitable for the thickness of a TIA sheet that it is the range of 0.3–15mm. If less than 0.3mm of thickness is not enough as mechanical strengths of a TIA sheet, such as rigidity, and it exceeds 15mm, the weight of a TIA

activity and handling will be produced.
[0023] When a TIA sheet is used for conveyance and packing of a container of which health nature, such as a container for eating-and-drinking articles or a container for chemicals, is required, in order to suppress that mold and saprophytic bacteria are generated on a TIA sheet, it is desirable to add an antimicrobial agent to a front face at least. Especially as an antimicrobial agent, although not restricted, the soluble glass containing antibacterial metals, such as silver, copper, and zinc, especially complex ion can be used suitably. Moreover, as an approach of adding an antimicrobial agent to a TIA sheet, both the approach of applying an antimicrobial agent to the front face of the TIA sheet after shaping and the approach of adding an antimicrobial agent as the 4th component to the Tia sheet material before shaping are applicable. Since the spreading process after shaping is unnecessary, a production process is simplified and the approach of adding an antimicrobial agent to the Tia sheet material before shaping can aim at reduction of a manufacturing cost.
[0024] Although the TIA sheet of a monolayer was mentioned as the example and the example mentioned above explained it, it is good also as multilayer structure. In this case, the amount of conductive fiber and the copolymerization resin used can be reduced by considering as the structure which used as the main stratum the sheet which consists of polyolefine system resin, made the surface the above-mentioned sheet which contains the 1st – the 3rd component at least, and carried out the laminating to those one side or both sides.

[Translation done.]

EXAMPLE

[Example] Below, the concrete example of this invention is explained with the example of a comparison.
[0026] (Example 1) As polyolefine system resin which is the 1st component, using the antistatic agent by Sanyo Chemical Industries, Ltd., and PERESUTATTO 3000 (trade name) as copolymerization resin which is the carbon fiber by Toho Tenax Co., Ltd., BESUFAITO HTA (trade name), and the 3rd component, as conductive fiber which is Sun Alomar polypropylene, E300A (trade name), and the 2nd component, these were mixed, it fabricated with monolayer T-die equipment, and the TIA sheet whose thickness is 1mm was created. The copolymerization resin used by this example has polypropylene as a polyolefine system frame, and has a polyethylene glycol as a hydrophilic polymer frame. Moreover, the content of conductive fiber made the content of 10 mass % and copolymerization resin 5 mass %. The forming performance force of monolayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0027] (Example 2) The TIA sheet of the two-layer structure of a main stratum and a surface was produced using multilayer T-die equipment. Sun Alomar polypropylene and E300A (trade name) were used for the ingredient which constitutes a main stratum. The surface was taken as the same presentation as what was used in the example 1. The main stratum set to 0.85mm, and the surface set thickness of each class to 0.15mm, and it set thickness in the whole TIA sheet to 1mm. The forming performance force of multilayer T-die equipment is a part for 10m/at the maximum, and was fabricated by this example with the maximum velocity.
[0028] (Example 1 of a comparison) The polypropylene and the carbon fiber which were used in the example 1 were mixed, it fabricated with the same monolayer T-die equipment as an example 1, and the TIA sheet whose thickness is 1mm was produced. The content of a carbon fiber was made into 10 mass %. The shaping rate of a TIA sheet was considered as a part for 10m/.
[0029] (Example 2 of a comparison) The TIA sheet was produced like the example 1 of a comparison except having considered the shaping rate as a part for 4m/.
[0030] A presentation and assessment result of the examples 1 and 2 mentioned above and the examples 1 and 2 of a comparison are shown in a table 1. In addition, in a table 1, the case where the case where a TIA sheet is fabricated with the maximum velocity of shaping equipment is fabricated at the rate below "O" and one half of maximum velocity is expressed with "x" about productivity.
[0031]
[A table 1]

	組　　成	成形速度 (m／分)	表面固有抵抗値 (Ω)	生産性
実施例1	ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール）	１０	10^{6}	○
実施例2	表層 ポリプロピレン 炭素繊維　１０質量% 共重合樹脂　５質量% （ＰＰ／ポリエチレングリコール 主層 ポリプロピレン	１０	10^{6}	○
比較例1	ポリプロピレン 炭素繊維　１０質量%	１０	10^{10} 以上	○
比較例2	ポリプロピレン 炭素繊維　１０質量%	4	10^{6}	×

[0032] In the examples 1 and 2, even if fabricated by the maximum capacity of T-die equipment, it could fabricate satisfactory, and the surface specific resistance value was also able to be set to 107ohms or less, and the TIA sheet with sufficient antistatic engine performance was able to be obtained. On the other hand, when a shaping rate tends to be carried out early and it was going to raise productivity in the example of a comparison, the network structure of a carbon fiber was not fully able to be formed, consequently a surface specific resistance value was not able to become high, either, and the required antistatic engine performance was not able to be given (example 1 of a comparison). On the contrary, if the network structure of a carbon fiber tends to be formed and it is going to set a surface specific resistance value to 107ohms or less, a shaping rate will become slow and productivity will fall (example 2 of a comparison). As mentioned above, the TIA sheet which has the antistatic engine performance by which the network of a carbon fiber was formed good and stabilized by making copolymerization resin with a polyolefine system frame and a hydrophilic polymer frame contain can be manufactured for high productivity.

[Translation done.]